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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/584,263	12/28/2006	Michitsugu Mori	292877US2PCT	5680

22850 7590 10/10/2008
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EXAMINER	
DUNLAP, JONATHAN M	

ART UNIT	PAPER NUMBER
2855	

NOTIFICATION DATE	DELIVERY MODE
10/10/2008	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/584,263	MORI ET AL.	
	Examiner	Art Unit	
	Jonathan Dunlap	2855	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 August 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-9* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

2. **Claims 1, 5 and 9** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Soltz (U.S. Patent 4,397,194)** in view of **Takada et al. (JP 2001-329654)** and **Takeda et al. (NPL - Flow Mapping of Mercury Flow)**.

Considering claims 1 and 9, Soltz discloses an ultrasonic flowmeter for measuring a flow rate of a fluid to be measured, comprising:

- an ultrasonic transducer including:
    - an ultrasonic transmitter **11,12** for launching ultrasonic pulses of a prescribed frequency into the fluid to be measured in fluid pipe **10** from the ultrasonic transducer along a measurement line (**Figure 2; Column 5, lines 8-42**);
    - a receiver for receiving ultrasonic echoes reflected from a measurement region among the ultrasonic pulses incident into the fluid to be measured (**Figure 2; Column 5, lines 52-56**); and
        - a wedge **16** for fixing said ultrasonic transducer **11,12** to the outer surface of the fluid pipe **10** for the fluid to be measured (**Column 5, lines 8-42**).

The invention by Soltz fails to disclose:

- a flow velocity distribution measurement means for measuring flow velocity distribution of the fluid to be measured in the measurement region based on the received ultrasonic echoes; and
- a flow rate operation means for calculating a flow rate of the fluid to be measured in the measurement region based on the flow velocity distribution of the fluid to be measured.

3. However, Takada teaches

- a flow velocity distribution measurement means **16** for measuring flow velocity distribution of the fluid **12** to be measured in the measurement region based on the received ultrasonic echoes (**[0016]; [0034]**); and
- a flow rate operation means **17** for calculating a flow rate of the fluid **12** to be measured in the measurement region based on the flow velocity distribution of the fluid to be measured (**[0016]; [0034]**).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize a flow velocity distribution measurement means and a flow rate operation means as taught by Takada in the invention by Soltz. The motivation for doing so is that the Doppler ultrasonic flowmeter that uses a technique of instantaneous flow velocity profiling has been found to present high accuracy and responsiveness in measuring the flow rates of fluids (**[0016]**)

The invention by Soltz, as modified by Takada, fails to disclose that the transducer is fixed on the wedge such that at the prescribed frequency a distance of wave propagation from said ultrasonic transducer to an outer surface of the fluid pipe Is

an integral multiple of a half-wave length of an ultrasonic wave incident into the fluid to be measured, and the prescribed frequency is determined by determining a distance of wave propagation from the outer surface of the fluid pipe to an inner surface of the fluid pipe and setting the prescribed frequency as a frequency of an ultrasonic wave for which the distance of wave propagation from the outer surface of the fluid pipe to the inner surface of the fluid pipe is an integral multiple of a half-wave length of an ultrasonic wave incident into the fluid to be measured.

4. However, Takeda teaches that the distance between the transmitter and the wedge, as well as the wall thickness should be integral multiples of the half-wave length of the frequency incident to the fluid **(Page 162, Equation 2)**.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize a wedge thickness and a wall thickness of an integral multiple of a half-wave length of the incident frequency as taught by Takeda in the invention by Soltz, as modified by Takada. That motivation for doing so is found in the teachings of Takeda, in that the maximum transmission efficiency occurs at integral multiples of the half-wave length **(Page 162, Equation 2)**.

Considering claim 5, Soltz discloses a wedge for an ultrasonic flowmeter for measuring a flow rate of a fluid to be measured, the flowmeter comprising:

- an ultrasonic transducer including an ultrasonic transmitter **11,12** for launching ultrasonic pulses of a predetermined frequency into the fluid to be measured in fluid pipe **10** from an ultrasonic transducer **11,12** along a measurement line **(Figure 2; Column 5, lines 8-42)**;

- a receiver for receiving ultrasonic echoes reflected from a measurement region among the ultrasonic pulses incident into the fluid to be measured (**Figure 2; Column 5, lines 52-56**); and

    - wherein said wedge comprises: a fixation unit configured to fix said ultrasonic transducer to the fluid pipe relating to a fluid to be measured and that the transmitter is fixed to the fixation unit (**Column 5, lines 13-16**).

The invention by Soltz fails to disclose:

- a flow velocity distribution measurement means for measuring flow velocity distribution of the fluid to be measured in the measurement region based on the received ultrasonic echoes; and
- a flow rate operation means for calculating a flow rate of the fluid to be measured in the measurement region based on the flow velocity distribution of the fluid to be measured.

5. However, Takada teaches

- a flow velocity distribution measurement means **16** for measuring flow velocity distribution of the fluid **12** to be measured in the measurement region based on the received ultrasonic echoes (**[0016]; [0034]**); and
- a flow rate operation means **17** for calculating a flow rate of the fluid **12** to be measured in the measurement region based on the flow velocity distribution of the fluid to be measured (**[0016]; [0034]**).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize a flow velocity distribution measurement means and a flow rate operation means as taught by Takada in the invention by Soltz. The motivation for doing so is that the Doppler ultrasonic flowmeter that uses a technique of instantaneous flow velocity profiling has been found to present high accuracy and responsiveness in measuring the flow rates of fluids (**[0016]**).

The invention by Soltz, as modified by Takada, fails to disclose that the transducer is fixed on the wedge such that at the prescribed frequency a distance of wave propagation from said ultrasonic transducer to an outer surface of the fluid pipe Is an integral multiple of a half-wave length of an ultrasonic wave incident into the fluid to be measured, and the prescribed frequency is determined by determining a distance of wave propagation from the outer surface of the fluid pipe to an inner surface of the fluid pipe and setting the prescribed frequency as a frequency of an ultrasonic wave for which the distance of wave propagation from the outer surface of the fluid pipe to the inner surface of the fluid pipe is an integral multiple of a half-wave length of an ultrasonic wave incident into the fluid to be measured.

6. However, Takeda teaches that the distance between the transmitter and the wedge, as well as the wall thickness should be integral multiples of the half-wave length of the frequency incident to the fluid (**Page 162, Equation 2**).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize a wedge thickness and a wall thickness of an integral multiple of a half-wave length of the incident frequency as taught by Takeda in

the invention by Soltz, as modified by Takada. That motivation for doing so is found in the teachings of Takeda, in that the maximum transmission efficiency occurs at integral multiples of the half-wave length **(Page 162, Equation 2)**.

7. **Claims 2-4 and 6-8** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Soltz (U.S. Patent 4,397,194)** in view of **Takada et al. (JP 2001-329654)** and **Takeda et al. (NPL - Flow Mapping of Mercury Flow)** as applied to claim 1 above, and further in view of **Huang (PG-PUB 2002/0011120)**.

Considering claim 2, the invention by Soltz, as modified by Takada and Takeda, fails to disclose explicitly that the wedge contact surface is fitted to equal the curvature of the fluid pipe.

8. However, Huang teaches that the wedge contact surface is equal to the curvature of the fluid pipe **([0046])**.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize a contact surface of equal curvature to that of the fluid pipe as taught by Huang. The motivation for doing so is found in the teachings of Huang, "an angled wedge with a contact face fitted to the pipe curvature [allows] efficient energy transmission along the axial direction of the pipe" **([0046])**.

Considering claim 3, Soltz teaches that a distance from the ultrasonic transducer to the outer surface of the fluid pipe contacting the wedge is longer than the distance obtained from multiplying a velocity of the ultrasonic wave penetrating through the wedge by a time of dead zone that an ultrasonic oscillator of the ultrasonic transducer carries (**The Examiner takes the position that if the distance is not longer then the**

dead zone distance, the transmitter will not be capable of detecting fluid flow at directly opposite the pipe wall. The dead zone distance is the time of dead zone multiplied by the velocity of the propagating wave. The distance must be long enough to allow the transmitter to detect a pulse, as required by the definition of dead zone; the amount of distance before which an ultrasonic transducer is incapable of detecting an object.).

Considering claim 4, Soltz discloses that the material of the wedge from the ultrasonic transmitter and receiver to the outer surface of the fluid pipe is made of stainless steel (**Column 1, lines 40-57**).

The invention by Soltz fails to disclose what the pipe is made of.

The invention by Soltz, as modified by Takada, teaches that the pipe can be made of various types of steel (**[0064]; [0066]**).

9. However, Takeda teaches that the acoustic impedance match is a factor in the determination for the efficiency of the transmission of an ultrasonic wave into pipe. (**Page 161-162; Equation 2. The Examiner interprets equation 2 to show that the maximum transmission occurs at integral multiples of half-wave length regardless of the acoustic impedance relationship. However, the minimum transmission is dependant upon the relationship in the acoustic impedances. The equation shows the as the impedances approach one another the minimum efficiency approaches that of the maximum. The use of a stainless steel wedge and a steel pipe would therefore approach a minimum efficiency that is comparable to the maximum efficiency**).

Considering claim 6, the invention by Soltz, as modified by Takada and Takeda, fails to disclose explicitly that the wedge contact surface is fitted to equal the curvature of the fluid pipe.

10. However, Huang teaches that the wedge contact surface is equal to the curvature of the fluid pipe (**[0046]**).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize a contact surface of equal curvature to that of the fluid pipe as taught by Huang. The motivation for doing so is found in the teachings of Huang, "an angled wedge with a contact face fitted to the pipe curvature [allows] efficient energy transmission along the axial direction of the pipe" (**[0046]**).

Considering claim 7, Soltz teaches that the distance from the ultrasonic transducer in the ultrasonic transmitting unit to the outer surface of the fluid pipe is longer than a distance calculated by multiplying a velocity with which an ultrasonic wave penetrates through the wedge and a time of dead zone that an oscillator of the ultrasonic transducer carries (**The Examiner takes the position that if the distance is not longer then the dead zone distance, the transmitter will not be capable of detecting fluid flow at directly opposite the pipe wall. The dead zone distance is the time of dead zone multiplied by the velocity of the propagating wave. The distance must be long enough to allow the transmitter to detect a pulse, as required by the definition of dead zone; the amount of distance before which an ultrasonic transducer is incapable of detecting an object.**).

Considering claim 8, Soltz discloses that the material of the wedge from the ultrasonic transmitter and receiver to the outer surface of the fluid pipe is made of stainless steel (**Column 1, lines 40-57**).

The invention by Soltz fails to disclose what the pipe is made of.

The invention by Soltz, as modified by Takada, teaches that the pipe can be made of various types of steel (**[0064]; [0066]**).

11. However, Takeda teaches that the acoustic impedance match is a factor in the determination for the efficiency of the transmission of an ultrasonic wave into pipe. (**Page 161-162; Equation 2. The Examiner interprets equation 2 to show that the maximum transmission occurs at integral multiples of half-wave length regardless of the acoustic impedance relationship. However, the minimum transmission is dependant upon the relationship in the acoustic impedances. The equation shows the as the impedances approach one another the minimum efficiency approaches that of the maximum. The use of a stainless steel wedge and a steel pipe would therefore approach a minimum efficiency that is comparable to the maximum efficiency**).

Response to Arguments

12. Applicant's arguments filed August 12, 2008 have been fully considered but they are not persuasive.

13. Applicant contends, according to claims 1-9, that Takada II fails to disclose setting a transducer distance to the outer surface of a fluid pipe based on both a predetermined frequency and keeping the transducer distance an integral multiple of a

half-wave length of the wave, where the predetermined frequency is determined by the frequency at which a distance of propagation of the wave while inside the pipe wall is an integral multiple of a half-wave length of the wave incident the fluid.

14. With reference to equation 2 of Takada II:

$$\frac{\partial}{\lambda} = \frac{n}{2} \Rightarrow \partial = \frac{n\lambda}{2} \Rightarrow \lambda = \frac{2\partial}{n}$$

15. The distance provided in the above equation is a thickness of the pipe along the wave propagation. To maximize the transmission quality, it is shown that the wavelength/frequency of the wave should be integral divisors of twice the distance of the wave propagation. Takada clearly outlines the steps for determining the prescribed frequency such that the distance of propagation of the wave while inside the pipe wall is an integral multiple of a half-wave length of the wave incident to the fluid. The method shown by Takada II is for a transmitter without a wedge. However, the previous combination of Soltz in view of Takada I has already disclosed an ultrasonic transducer with a wedge. The disclosure of Takada II teaches that the maximum transmission quality occurs when the total distance is an integral multiple of an incident half-wave length. Therefore, the distance of the wedge is also taught as having a distance equal to a integral multiple of a half-wave length of an incident wave to the fluid.

Conclusion

16. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jonathan Dunlap whose telephone number is (571)270-1335. The examiner can normally be reached on M-F 9-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Harshad Patel can be reached on (571) 272-2187. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Harshad Patel/
Primary Examiner, Art Unit 2855

/J. D./
Examiner, Art Unit 2855
October 6, 2008